

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 8.]

AUGUST.

[1887.

[*Introduction of certain West Indian Food-plants to the East Indies.*

In the following notes information is given respecting certain food-plants from the West Indies recently introduced to the East Indies, and which are now established in the latter. These are the Tree Tomato (*Cyphomandra betacea*), the Chocho (*Sechium edule*), the Arracacha (*Arracacia esculenta*), and the Cherimoyer (*Anona Cherimolia*).

The introduction of the Arracacha was first attempted, at the instance of the Government of India, in 1879, but, after many failures, was only successfully accomplished in 1883. The Chocho was introduced to Ceylon by means of a single plant, which survived the journey direct from Jamaica to Ceylon, in January 1885. The Tree Tomato and Cherimoyer were introduced by seeds, which travel well, and are more convenient for distribution than plants. In a few years, no doubt, all these plants will be widely distributed throughout the East, and they will be found useful additions to the vegetable diet of both Europeans and natives. Already the Chocho introduced to Ceylon as recently as 1885 is to be found in the local markets; and the Tree Tomato is mentioned "as a most valuable acquisition to Southern India."

All the four plants here mentioned are likely to thrive at Hill Stations in India and in all districts suitable for coffee and cinchona cultivation. They are sub-tropical rather than tropical in their requirements, and hence no doubt they will be found of service in South Africa, in certain parts of Australia, Northern New Zealand, and in hilly districts generally throughout our tropical possessions. The information here summarized will indicate their usefulness as food-plants and the sources both in the Old and New World from which future supplies of seeds and plants may conveniently be obtained.]

L O N D O N :

PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,
BY EYRE AND SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.

And to be purchased, either directly or through any Bookseller, from
EYRE AND SPOTTISWOODE, EAST HARDING STREET, FLEET STREET, E.C.; or
ADAM AND CHARLES BLACK, 6, NORTH BRIDGE, EDINBURGH; or
HODGES, FIGGIS, & Co., 104, GRAFTON STREET, DUBLIN.

1887.

Price Twopence.

XIII.—TREE TOMATO.

(*Cyphomandra betacea*, De Candolle.)

Although called a tomato, this plant, which is a native of the Andean regions of Tropical America, is a large free-growing shrub or small tree, often attaining a height of 8 to 12 feet. The fruit in form is more like that of the egg-plant or brinjal, but in colour and flavour it more nearly approaches the tomato. Like these two, however, it belongs to the natural order Solanaceae.

It appears as *Solanum betaceum* in Cavanilles, Ic. n. 599, tab. 524, which gives a fairly good figure of both the plant and the fruit. A large coloured plate of the leaves and flowers appears in the Botanist's Repository, tab. 511. In the *Revue Horticole*, 1880, p. 150, there is a coloured illustration of the plant with flowers and fruit, which is reproduced in the *Gardener's Chronicle*, Third Series, Vol. I. (1887), p. 383, with a description by Mr. D. Morris. Fuller notes are given by the same writer in *Gardener's Chronicle*, N.S., Vol. XXI. (April 19, 1884), p. 510. The illustration from the *Gardener's Chronicle*, by kind permission of Dr. Masters, F.R.S., we are able to give on the opposite page. The fruit in this instance is much too pointed and gives the appearance of not being fully ripe. A much better illustration of the fruit is given in *Revue Horticole* for 1881, p. 470, which is intended to represent two varieties obtained from seed of the plant figured in 1880.

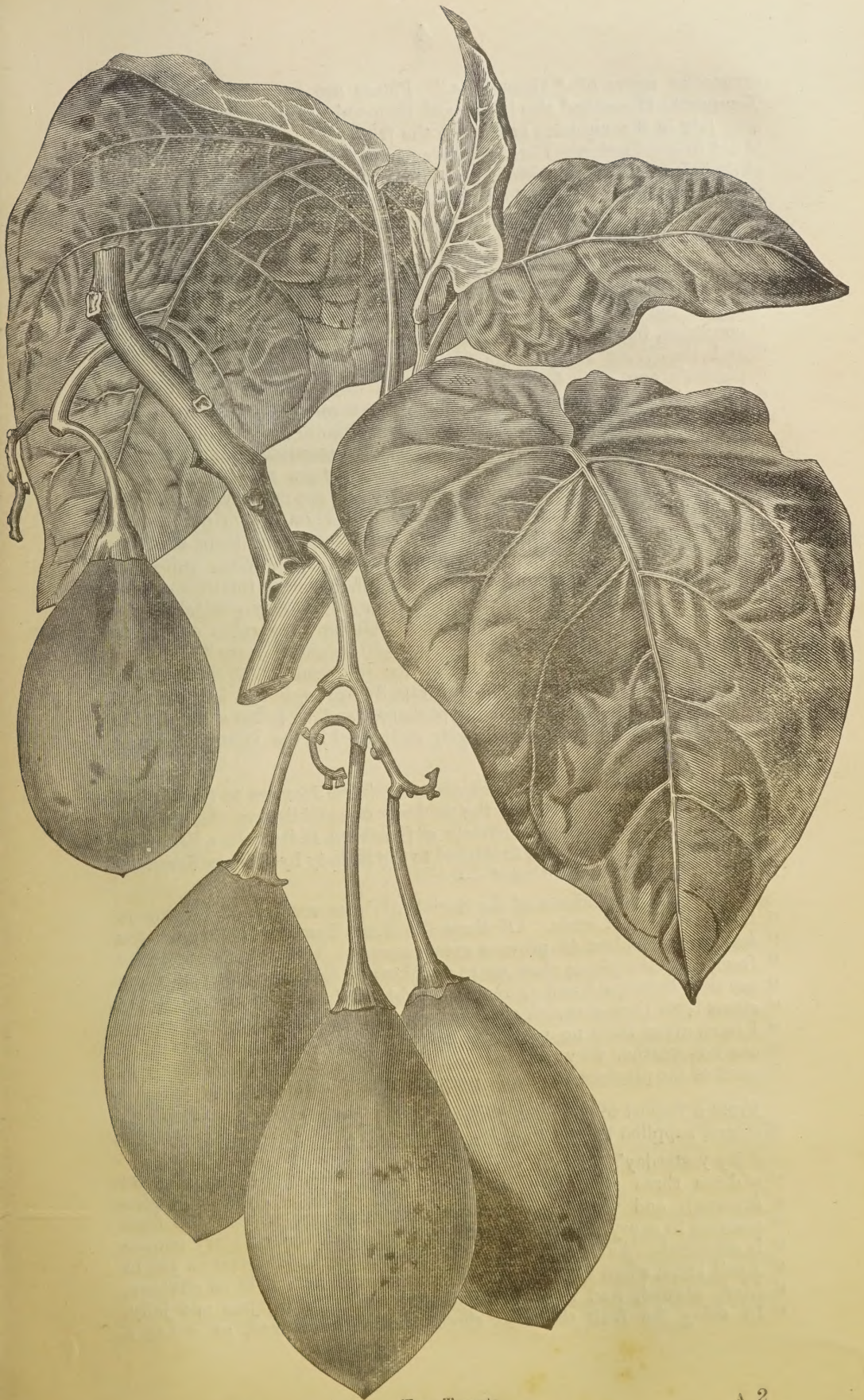
The leaves are large (sometimes a foot long), broadly cordate, and softly pubescent, generally confined to the termination of the branches. The fragrant flowers appear as sub-axillary cymes of a pale fleshy colour, with bright yellow stamens, followed by an obconical or ovate fruit, which at first of a greenish or purplish tint gradually assumes a warm reddish colour as it approaches maturity. The bilocular fruit is of firm texture, about 2 to 2½ inches long, and about 2 inches in diameter. The pericarp is about ¼ inch in thickness, of a pale orange colour.

On the mainland of Central America it is known as the Tomato de la Paz, in Jamaica as the "Tree Tomato," and sometimes, on account of its supposed beneficial action on the liver, "Vegetable Mercury." Plants are easily raised from seed, and come into bearing in about two years. They are very prolific bearers, and the fruit is available during the winter months, November to March, when ordinary tomatoes are not so easily obtained.

If the fruit is allowed to fully ripen on the trees it may be eaten raw, and it has somewhat the flavour of gooseberry. If the skin is removed and the fruit (without the seeds) stewed with sugar, it resembles apricot, but with a slight sub-acid flavour, which is very refreshing.

Mr. Miers (Hook. Journ. Botany, 1845, p. 358) describes this plant under the name of *Pionandra betacea*, and mentions that "this is doubtless the same fruit that I saw in the markets of Lima, where it is commonly used for cooking in lieu of the ordinary tomato, the flavour of which it resembles."

The Tree Tomato was introduced to Jamaica many years ago, and it is sparingly met with on old coffee plantations in the hills of St. Andrew and Manchester. It does not flourish in the plains. Its range of elevation in Jamaica is from 2,000 feet to 5,000 feet, with a range of temperature from 72° to 63° Fahr. It is found at Madeira and the Azores, and cultivated in the South of Europe. According to Dr. Masters, the fruit is occasionally seen in Covent Garden Market under the



Tree Tomato.

erroneous name of "Grenadilla." Plants are grown at Kew in the Temperate House and also in the cool Economic House. They generally bear late in the autumn, and hence the fruit seldom ripens properly and is not in good order. Through the agency of the Botanical Department at Jamaica seed of this plant and information respecting it have been widely distributed throughout British Colonies, and it may now be considered fairly established in most of the regions of a sub-tropical character suited to its growth.

In the Report of the Director of the Botanical Gardens, Ceylon, for the year 1884 it is stated that the *Cyphomandra betacea* "is a close ally of the ordinary Tomato, and a native of Peru and neighbouring countries, but cultivated on the hills in many parts of South America and the West Indies. Its fruit, which is red, and the size of a pigeon's egg, may be employed in all ways like the tomato, and resembles it in flavour. Seeds have been received from Jamaica, and there are now many young plants at Hakgala."

In the Report for the year 1885, Dr. Trimen mentions that at Hakgala at 6,000 feet some of the Tree Tomato plants "are now 11 feet high, and the fruits produced are very fine. They are egg-shaped, about 3 inches long and 2 inches in diameter, and when fully ripe are of a bright yellowish-red colour. They make excellent tarts, are very good stewed, and are much relished by most people when quite ripe and eaten raw, like gooseberries. The plant is very robust and easy to grow here, and I believe it will thrive and be very profitable from an elevation of 2,000 to 6,000 feet. Under favourable conditions the plant remains in bearing for many (10 or more) years."

In the last Report to hand, that for the year 1886, it is stated that "the Tree Tomato has spread rapidly through the hill country. This fruit keeps well after being gathered, and as it has a tough skin and travels well it might be largely cultivated in the villages for sale in the towns."

Large quantities of seeds were also sent from Jamaica to the Madras Agri-Horticultural Society for the purpose of establishing the plant in the Nilgiris and other hilly districts of Southern India. In a Report on the Shevaroy Hills for 1884, furnished to the Society by Deputy Surgeon-General Shortt, it is mentioned :—

"Through the kindness of the Society, I have received from time to time a variety of seeds. Of these the Tree Tomato (*Cyphomandra betacea*) promises to prove a great success. The seeds germinated freely, and the plants shot up so wonderfully fast that some of them are now between 5 and 6 feet in height, without a branch, but the stems from their greenish appearance seem as if they were herbaceous. I have given them no particular care, and they have stood the test of our hot weather very well indeed. I distributed the plants freely to most of the planters and other permanent residents here."

From a Report to the same Society, dated 29th October 1885, from Mercara, supplied by the Rev. Dr. G. Richter, it is stated :—

"By yesterday's Banghy post I had the pleasure to despatch to your address three ripe fruits of the "Tree Tomato" (*Cyphomandra betacea*), and would now remark that in my experience the fruit answers in every respect the purposes for which the ordinary tomato is esteemed. As Mr. Morris, of Jamaica, stated in his letter to you in April 1884, when he sent the seeds, it proved agreeable as chutney, fried, stewed, and in a tart, and may be useful for jam and jelly. In using the fruit the rind should be well removed, as it has a

“peculiar and disagreeable flavour; the pulp itself has a flavour of its own, pleasantly acid, not like the ordinary tomato, but more resembling that of the fruit of the *Passiflora edulis*. The plants were grown in rather damp soil and standing close together. I removed them in September to different localities, but though full of fruit not one tree died or suffered. Flowering in May the blossoms set well, and the fruits stood the monsoon better than I had anticipated, as only few of the fruits dropped, and some of the young trees bore over fifty. Now most of the trees show new flowers along with the ripening fruits, which are larger than those I sent and may fully attain the size of a duck's egg. I have given away some of the plants and I hear they prove a success everywhere. So you have secured the thanks of many for the introduction of this valuable economic plant.”

Having noticed than an unfavourable impression had been produced at Madras respecting the growth of the plant and character of the fruit, Mr. Morris addressed the following letter to the Honorary Secretary, dated Kew, 6th July 1886:—

“I notice that in your Report you do not speak very favourably of the ‘Tree Tomato’ in Southern India.

“It is quite possible that it may not be quite so good with you as it undoubtedly is in the West Indies, but, on the other hand, it may be found on larger knowledge and experience to possess qualities which may commend it to general approval.

“The fruit should be allowed to fully ripen on the tree. This is an essential point as regards flavour and size. For cooking purposes all the seeds should be removed and the outer skin. Then cut the fleshy part into quarters, and stew or cook as you would apricot or peach, or make into jam or jelly. If found too acid, steep in boiling water for a few minutes before using, and the flavour will be much milder. The planters in Jamaica attribute to it very beneficial properties as regards liver disease; and indeed my attention was first drawn to it under the name of ‘vegetable mercury.’ I cannot say anything about its medicinal properties for I have had no opportunity to test them; but I can certainly speak highly of it as a fruit prepared in the manner above described.”

A letter to the same effect was forwarded from Coonoor by Mr. Charles Gray, dated August 1886:—

“I notice in the Annual Report for the past year that the ‘Tree Tomato’ is said to have proved a failure in Madras as regards the flavour of the fruit. All I can say is that on the Nilgiris every one that I have given a fruit to has pronounced it most delicious; and, if the longing looks cast on the fruits on the tree after one has been given as a trial are to be taken into account, I quite believe it. Unfortunately my supply is limited or I could have disposed of hundreds, and if you have any surplus seed I should be glad of a supply, as I am continually asked for some. I write this, as I for one (and there are many others here too) am decidedly in favour of its propagation, it being a valuable addition to our limited list of really tasty fruits, as well as being most ornamental.”

In a letter dated 14th July 1886 Deputy Surgeon-General Shortt gives further information respecting the plant in the Madras Presidency:—

“Of seeds and plants introduced, the Tree Tomato, or *Cyphomandra betacea*, has proved a great success. The plants have attained from 10 to 12 feet in height, and are covered with fruits. I have not only

“ sent the Society green and ripe fruits at different times, but at the
 “ last flower show I submitted 24 ripe fruits for exhibition. This fruit
 “ promises to become a most valuable acquisition to Southern India
 “ as a vegetable and fruit producing tree. They not only thrive well
 “ on these hills from 1,000 to 5,000 feet, but they have also succeeded
 “ well in Travancore and other localities to which I have distributed
 “ the seeds collected from trees grown here.”

* * * * *

“ They might be taken for the Brinjal (*Solanum Melongena*) were it
 “ not for the acid flavour it imparts to a stew or curry. I am indebted
 “ to Mr. D. Morris, Director of the Botanical Gardens, Jamaica,
 “ for a supply of seeds independent of those I received from the Society,
 “ and which I have distributed far and wide.”

Dr. George King, F.R.S., Superintendent of the Botanical Gardens, Calcutta, states that Tree Tomato is established at Darjeeling and is a most useful introduction.

It appears also to have been successfully introduced into the North-west Provinces, and is noticed by Mr. Duthie in the following words in his Annual Report on the Saharunpur Gardens for the year 1886 :—

“ This plant is thriving as well as could be desired in the climate of
 “ Arnigádh. It has not as yet produced fruit, but I expect to see a
 “ crop this season. It has withstood the winter without any protection,
 “ and has thus proved to be quite hardy at this elevation. The plant is
 “ very ornamental when of full growth, and on this account alone it
 “ would always be worthy of a place in the garden. It is easily raised
 “ from seed, and when it begins to fruit the plant should soon become
 “ common in the gardens. At present the stock of plants numbers 50.”

At Hong Kong the Tree Tomato is established, and has produced crops of fruit which, however, owing to unfavourable weather had not ripened during the past year.

XIV.—CHOCHO.

(*Sechium edule*, Sw.)

This is a cucurbitaceous plant well known in Tropical America, where its wholesome fruit is commonly used by all classes as an article of food. In Brazil it is called *Chuchu*, in Jamaica *Chocho*, in the French Islands *Christophine*, in the English colonies *Vegetable pear*, at Madeira *Pipinella*, *Chayota*, or *Chahiota*.

The plant is a climber with three to five-cleft tendrils, and a smooth somewhat stout stem rising from a very large fleshy perennial root having the appearance of a yam. The leaves are heart-shaped, rough to the touch, and five angled. The flowers are green or yellow, with separate male and female flowers on the same plant. The fruit is pear-shaped, about three to five inches long, covered with soft prickles, and either green or cream coloured. The one seed or kernel is like a large thin almond. There are two well-marked varieties, (*a*) with flower and fruit of a pale green colour, and (*b*) with flower and fruit rather larger, cream coloured or white.

As a West Indian plant reference is made to the Chocho by Hans Sloane and Patrick Browne, but it was first described and named by Swartz, Fl. Ind. Occ., Vol. II., p. 1150. It was mentioned and figured by

Jacquin as *Chayota edulis* (Amer. ed. pict. II. tab. 245). Descourtilz places it under *Cucumis acutangulus* (Fl. des Antilles, v. 94, tab. 328) as common in the Island of St. Christopher, and gives a fairly good drawing of the fruit, which, however, has nothing to do with *C. acutangulus*, Linn., now known as the common Luffa. The plant was recently figured and described by Cogniaux in Flora Brasiliensis, Vol. II., pt. 4, p. 111, tab. xxxv. In this the fruit is evidently drawn from dried specimens and is not good. A better illustration of the fruit from a specimen received from Madeira, with a description by the Rev. M. J. Berkeley, is given in *Gardener's Chronicle*, 1865, p. 51.

De Candolle states that "the plant is probably a native of the South of Mexico and of Central America, and was transported into the West India Islands and to Brazil in the eighteenth century."

At present it is widely distributed in all parts of Tropical America, and it has also been introduced to Madeira and the Atlantic Islands, from whence the fruit is sometimes sent to the English market under the name of Chayote.

The introduction of this useful plant to some of our possessions in the East Indies was effected during the last two or three years, and already very gratifying accounts have been received of it.

In the West Indies the Chocho is cultivated in the hills, and it flourishes at temperatures ranging from 63° Fahr. to 75° Fahr. It apparently fails in the lowlands, and may therefore be looked upon as requiring sub-tropical rather than tropical conditions. It is easily propagated by planting the whole fruit, which after germination of the seed gives rise to a persistent amorphous rhizome of a woody or a fibrous-fleshy character. The stem can easily be trained to grow over fences or arbours; but failing these it spreads along the ground, and has then much of the habit and appearance of the common vegetable marrow.

The Rev. R. T. Lowe, who met with this fruit at Madeira, mentions (Flora of Madeira, p. 292) that boiled it is a favourite vegetable and highly esteemed. It resembles a young pumpkin rather than a cucumber, but when ripe is somewhat firmer, drier, or more mealy in consistence, with a peculiar nutty flavour. "The larger cream-coloured or white-fruited variety is better looking, but it is not considered so good as the green variety."

Macfadyen on the other hand states (Flora of Jamaica, Vol. II., p. 141) that the white variety "is by far the more delicate." He adds, "with the addition of lime-juice and sugar it supplies an ingredient for tarts; the root when dressed is very wholesome and palatable, and can scarcely be distinguished from the yam."

Lunan, in 1814 (Hort. Jamaicensis, Vol. I., p. 182), states that "the fruit is an agreeable, wholesome vegetable, but is much improved by lime juice, by salt or spicy ingredients. Mixed with lime juice and sugar it is a good substitute for apple sauce. The vine bears all the year round and makes very good arbours. The root of the old vine on being boiled or roasted is farinaceous and wholesome. The seeds (of which each fruit contain only one) are very good if taken out after the fruit is boiled and fried with butter."

The introduction of the Chocho to Ceylon was effected by means of the Botanical Gardens in that island. In the Report of the Director for the year 1884, p. 13, it is stated that a case of plants received from Kew in October were all dead on arrival, but that out of a box of germinating seeds sent direct from Jamaica in the following January

one survived, from which afterwards three rooted cuttings were obtained.

In the Report for 1885, p. 11, it is stated that the "Chocho" has been successfully established at Hakgala from the single surviving seed of those sent from Jamaica in January.

Mr. Nock, Superintendent of the Hakgala Gardens, reports :—

"After being nursed up in the propagating house for a few weeks the plant was put out at the end of February into the nursery. It commenced to bear in May and has continued to do so ever since, affording an excellent crop. The vegetable (fruit) it produces is pear-shaped, and the average weight is $3\frac{1}{2}$ lbs. The plant being perennial adds greatly to its value.

"As it is the first that has been grown in this country, it may be useful if I state the best way of cultivating it. It thrives best in a rich deep well-drained soil, but may be made to grow anywhere by preparing the site in the following manner :—Make a hole 4 or 5 feet in diameter and 18 inches to 3 feet deep according to the subsoil. If the subsoil is good and free you may go to the depth of 3 feet, but if it is clayey or likely to hold water 18 inches will be quite deep enough. Place a layer of rough stones at the bottom of the hole to a depth of 6 to 9 inches for drainage, and over this a few inches deep of small twigs or half-rotted leaves to prevent the fine soil from getting between the stones and choking the drainage. The hole may be filled up with the following compost : one third ordinary garden soil, one third half-rotted cattle or stable manure (cattle manure preferred for hot sandy soils, and stable manure for cold clayey soils), and the remaining third may be formed of leaf-mould, sand, wood ashes, lime, and the sweepings of the poultry yard, in about equal portions. When the hole has only been taken out about 18 inches deep, it will be necessary to raise the soil 18 inches above the ground ; indeed in every case except in very dry districts it is best to raise it. The whole fruit, which is sent out in a germinated state, must be planted about 3 inches deep in the centre of the hole. It begins to grow at once, and in a week or 10 days it will have made a good start. It is a creeper, and each plant will require a space of about 20 feet square."

"The Chocho also does very well at Pérádeniya, but the fruit does not there attain quite so large a size. I think it will be less suitable for the lower elevations. I consider it to be a very valuable introduction, and a real addition to the vegetables of Ceylon. It most resembles the vegetable marrow, but is, in my opinion, superior in flavour to the best varieties of that vegetable."

In the Report for 1886 Dr. Trimen mentions that—

"The Chocho of the West Indies (*Sechium edule*) has been widely distributed and has rapidly become common in the country. It is liked both by Europeans and by natives, and its easy culture is especially appreciated by the latter, by whom it is much esteemed for curries. I have noticed it for sale in the Kandy market at 1c. to 2c. the fruit."

In a letter addressed to Kew, dated 23rd October 1886, Mr. Nock mentions that—

"The Tree Tomato and Chocho from Jamaica are a great success here. They are well established in different parts of the island, and are much appreciated both by Europeans and natives. I should be much obliged if you will be good enough to use your influence in

“ getting for us from Jamaica the *white* variety of the Chocho (what we have is the green one), and I am under the impression that the white variety will grow down almost to sea-level, and the green one here begins to feel uncomfortable below 2,000 feet.”

The Chocho has long been established at Darjeeling, and according to Dr. King is very common there. From thence it has recently been introduced to Saharunpur, and is noticed as follows in the Report of Mr. Duthie for the year 1885 :—

“ *Sechium edule* is called ‘Chocho’ in the West Indies, where it is cultivated. Both the fruit and root are eaten. The fruit is oblong, about 4 inches long, and is considered to be wholesome and fattening. The large fleshy root, sometimes weighing as much as 20 lbs., is said to resemble a yam when cooked. The seed was sent to me from Darjeeling by Mr. Gammie, who has successfully cultivated the plant in his garden.”

In the Report on the Saharunpur Gardens for the year 1886 it is stated that—

“ The peculiar cucurbitaceous vegetable, the ‘Chocho’ of the West Indies, has taken kindly to the climate of Arnigádh, and is likely to prove a useful addition to our varieties of vegetables. Four plants were raised last year from seeds received from Mr. Gammie, Darjeeling, and as these ripened fruits the stock is now increased to 20 plants. It is expected that these will produce sufficient fruit this season for sowing a moderate-sized plot. As each fruit contains only one seed, the plant cannot be so quickly propagated as other cucurbitaceous plants, hence a stock sufficiently large for distribution requires time for production.”

In Mr. Morris’s Report on the Island of St. Helena, dated January 1884, attention was drawn to the desirability of introducing the Chocho to that island as a valuable and hardy vegetable.

Subsequently arrangements were made with Dr. Michael Grabham, of Madeira, for the despatch of Chocho fruits from Madeira to the Governor of St. Helena. Unfortunately the first lot kindly sent by Dr. Grabham miscarried, but in November of 1886 another lot was sent, and from a letter from the Acting Governor, Colonel Blunt, R.E., to the Colonial Office, dated 12 February 1887, it appears that “many of the plants are now growing.”

In the Appendix to the Report of the Superintendent of the Botanic Gardens, Singapore, for 1885, it is stated that the Chocho “established on Penang Hill in general excellence far surpasses all other cucumbers grown in the Straits.”

A plant of the Chocho is growing on the eastern side of the Succulent House at Kew, and several small plants are in the Temperate House. The large plant fruited the first year after it was imported, but it has never fruited since, although it is growing well. When the fruit is allowed to remain on the plant the seed germinates and develops both leaves and roots *in situ*. Specimens of fruits of Chocho are in the Kew Museums, presented by L. A. Monteiro, Esq.; from Mexico, presented by D. Hanbury, Esq.; from Venezuela, under the name of *Challote o’ Chayote*, presented by the Government of that Republic; and starch prepared from the root of Chocho at Jamaica, presented by Dr. Macfadyen.

XV.—ARRACACHA.

(*Arracacia esculenta*, De Candolle.)

The Arracacha is a valuable esculent common in the high lands of Venezuela, where it is regularly used as an article of food. The plant belongs to the natural order Umbelliferae, and in appearance and habit of growth resembles the common parsnip. It is called in Spanish *Apio*, from its resemblance to the celery, as a substitute for which the blanched shoots can be used. The root is a fleshy tuber of large size, bearing numerous knots or tubers on the outside.

Of these the shoots on the upper surface inclining upwards give off leafy growths, marked about the base with horizontal rings bearing membranous sheaths, which afterwards wither away. These shoots when ripe can be broken away from the parent tuber and form new sets for planting. The other shoots, which are given off below the ground, are generally eight to ten in number; the largest measure about 6 inches long by $1\frac{1}{2}$ to 2 inches in diameter. They are nearly of the same circumference throughout, tapering off suddenly and sending out a few fibres at the extremity. Their surface is nearly smooth, covered with a thin skin, marked across with transverse scars, like the roots of carrots. These underground shoots are called *hijos* (sons), and are the edible portions of the root, being more tender and more delicate in flavour than the main root or *madre* (mother).

The stem is 2 to 4 feet high, often streaked with purple. The leaves, rising directly from the root with long petioles, are deeply and irregularly pinnatifid. They are dark green and shining above, paler beneath. The flowers borne in umbels are of two kinds; those in the centre are imperfect or bear stamens only, and have a flat disk in the centre.

The origin of this plant is uncertain. It is generally cultivated in Venezuela, New Granada, and Ecuador as a nutritious food plant. De Candolle states that "the species is probably indigenous in the region where it is cultivated, but I do not find in any author a positive assertion of the fact. The existing descriptions are drawn from cultivated specimens."

"The best information about the cultivation of this plant was given by Dr. Bancroft to Sir William Hooker, and may be found in the *Botanical Magazine*, tab. 3,092. A. P. de Candolle published in *La 5^e Notice sur les Plantes Rares des Jardin Bot. de Genève* an illustration showing the principal bulb."

From notes supplied to Kew in October 1882 by Mr. D. Morris, who had cultivated the Arracacha at Jamaica, we find that it is propagated either from seed or from "sets," the latter being offshoots from the main stem, which are freely produced, and grow with great facility. The valuable part of the plant is the root. During growth this gives rise to a number of small tubers or "fingers," eight or ten in number. The largest are from 8 to 9 inches in length, and about 2 inches in diameter. They are yellow or white in colour, with a smooth surface, and marked, like the carrot, with transverse scars. At Bogota, the main root is styled the *madre*, while the young edible tubercles or fingers are called *hijos* (or sons). The younger fingers are considered the best, the older ones being fibrous and strongly flavoured.

The plant grows in almost any soil; it prefers, however, rich cool hollows, and in such situations is most prolific. It will even grow in stiff clay soils, as well as in those of a light sandy character, but under such circumstances the yield is not so great. At the Government Cinchona

Plantation, Jamaica, it is planted in ridges, like potatoes, about a foot or 18 inches apart.

The first crop takes from eight to ten months to mature; but, being perennial, fresh shoots are continually thrown out which give a succession of crops for several years. It would, however, be better to plant fresh "sets" at the beginning of every rainy season, and so secure a constant supply of young fingers.

To prepare Arracacha for the table, the roots are first scraped and then boiled; a little salt should be added; and if the roots are not quite young it is customary to change the water once or twice. After being boiled, they may be grated and employed as an ingredient for thickening soup; or, better still, mashed, mixed with pepper, salt, and a little butter, they form a most palatable dish.

Dr. Bancroft describes the following method of cultivating this plant at Bogota:—After separating the upper tubers, or knobs, from the root, detach from these the offsets, singly, each with its portion of the substance of the tuber, which is then to be pared smoothly all round at the bottom, the outer leaves being stripped or cut off, so as to leave a sprout from half to two or three inches at the most. If any germs or eyes be seen at the base of the offsets, these must be carefully cut out. Thus prepared, the shoots are planted in loose mould, in a slanting direction, at distances of 15 or 18 inches from each other, whether the ground be level or sloping. Afterwards, at intervals of about two months, the soil ought to be weeded; and when the plants have attained the height of 10 or 12 inches, or whenever they show a disposition to blossom, the budding tips should be taken off, as the process of flowering would hinder the root from coming to its greatest size, care being taken not to remove more than the budding extremities, lest the growth of the root should thereby also suffer; with the same view, any luxuriance in the shoots ought to be prevented, since it must be at the expense of the root. From time to time, and particularly after weeding the ground, fresh mould should be laid round the foot of each plant, to aid likewise in the enlargement of the root.

From a letter addressed to the British Consul-General at Bogota by Mr. Henry Burchall in 1878, it is gathered that Arracacha requires from 10 to 12 months to reach maturity, but the tubers may be gathered two months earlier if much wanted. In this case the produce is of course smaller, but it is said to be equally wholesome and agreeable to the taste. Mr. Burchall mentions that old or central portions of the root are never planted a second time, as they produce the *macho*, or a flowering stalk, and not edible roots. If seed is used instead of "sets" it would take two or three seasons before the plants attain their full growth. With ripe "sets," as mentioned above, the mature crop is reaped in 10 to 12 months.

A full account of the Arracacha is given by Diaz in *El Agricultor Venezolano*, from which we take the following notes:—

"The Arracacha is indigenous to Venezuela and New Granada, and belongs to the family of Umbelliferæ.

"Botanists have distinguished it by the name of *Arracacha esculenta*, preserving thus its primitive Indian denomination, and it was the first Spanish Colonists who called it Apio, generalising this name in such a fashion that many Venezuelans do not now know what the Arracacha is.

"It is raised generally from division of the crown or rootstock, provided with buds or shoots, and also from the seed, though less advantageously from the latter.

“ If it be requisite to raise from seed, a seed-plot must be prepared and care taken that there is no lack of watering ; the young plants must also be thinned out where very crowded. When it is time for transplanting the seedlings no more plants should be taken up than can be planted within the time, and they should be put meanwhile into water so that the roots are kept wet and thus unite better with the soil. The proper temperature is that of the cool zone at a height of 2,000 varas (yards), and the soil requires to be light, containing plenty of leaf-mould (humus) and well worked, as is necessary for all tuberous plants grown for their roots. It can be cultivated down to 500 varas (yards) but to little advantage, results improving gradually with the ascent from that level.

“ The proper season in natural non-irrigated lands is in the two springs of May and October, but in irrigated and highly cultivated ones sowing or planting can be done at any time, the plant being kept well weeded, watered, and earthed up like garden plants. If three months after planting they are tied up like endive, the shoots become blanched and can be employed as salad or be stewed.

“ The ordinary use which we make of the Arracacha, which we call also Apio, is to boil it or use it for forced meats or fritters. This root yields a large quantity of starch, and is preferred to “ sulu ” for the sustenance of invalids. It is in season at the fourth month.

“ The Arracacha requires a black soil, light and deep, which favours the development of the roots. To propagate it, it is cut in pieces, each with an eye or bud, and these are planted separately. After three or four months’ growth the roots are sufficiently developed for use in the kitchen ; if left in the ground for a longer period they acquire greater volume without depreciation of flavour.

“ The colour is white yellow or purple, but these variations do not affect the quality. The Arracacha which is most esteemed is produced in Lipacon, a small town situated two leagues north of Santa Fè de Bogota.

“ The Arracachas, like potatoes, do not thrive in very warm localities, in such places they form much leafage, but the roots are poor and insipid ; in temperate regions the produce is regular, but increases considerably in the cooler parts of Columbia, in which the medium temperature is 58° to 60° Fahr., equal to 12° Réaumur and 15° Centigrade. It is there that the root develops best and acquires the most delicious taste.

“ The flavour is agreeable and slightly sweet ; the odour is peculiar, to some people very pleasant but very repugnant to others. Amongst animals this repugnance to the smell is not remarked ; on the contrary, it appears to be exceedingly agreeable to them and to excite their appetite, since immediately they smell it they show a lively desire to eat, and all devour it with avidity and eagerly seek it. I have observed that animals can consume large quantities of the Arracacha in their daily ration of food without, in a single case, the least repugnance being remarked.

“ In connection with the importation of foreign cattle, the Arracacha is of all plants the most valuable, since in the transits from Honda to Bogota it is the forage which they accept with the greatest avidity, and that which enables them the soonest to recover from the poor condition in which they arrive. During the first months, whilst they are becoming acclimatized, the Arracacha is almost the only food

“ which will satisfy them, and they prefer it to green grass, hay, or any other forage.

“ When the crop is collected the roots with buds are separated and preserved for some days in order to form with them a new plantation ; but before planting them in the ground for development it is necessary to shorten the stem attached to the bud to about an inch, because it is said that if this precaution be not taken the plants will not yield Arracachas nor acquire the same development as they do when subjected to this mutilation. Furthermore, the leaves are suppressed which have already been formed ; at the time of planting they are cut off at about two to three inches from the collar.

“ Among the cultivated Arracachas we have distinguished three chief varieties ; the yellow, to which probably is due its name of xanthorrhiza, which is not applicable to the other ; the white, so called because the root is perfectly white, like some radishes and turnips ; and the violet or mulberry-coloured (morada), which is also white but has a violet or mulberry-coloured ring around the insertion of the crown, or similarly coloured spots upon the widest parts.

“ The yellow is the most common and almost the only sort cultivated in many localities ; it yields the largest crops, whether in numbers of roots or in their individual bulk. Of all the varieties the yellow is the most robust and resists best the inclemencies of the weather, but unfortunately it is also the tardiest grower.

“ The white is much in demand amongst connoisseurs, as it possesses a more agreeable flavour, softer texture, and other culinary advantages ; amongst the cultivators it is esteemed for its precocity, although it suffers more than the yellow when the meteorological conditions are not favourable, and its yield is always less as regards weight.

“ The violet or mulberry-coloured (morada) appears to possess the same qualities as the white, and to resemble that variety very closely both with respect to its merit as an esculent and as regards its cultivation.”

The attention of the Government of India having been directed to the value of Arracacha as a possible food plant for certain hilly districts of that country, several attempts were made to introduce it by seed and offsets. In a letter addressed by the Director of the Royal Gardens, Kew, to the India Office, dated the 4th January 1886, the introduction of the Arracacha to India is reported as follows :—

“ Referring to the letter addressed, 1st January 1879, to Sir J. Hooker by Mr. F. C. Danvers, respecting the transmission of tubers of *Arracacha* to India, I have now to inform you that the various attempts which have from that date been made to introduce this South American esculent into India have at last been rewarded with success.

“ No result of any importance was apparently obtained from the supply of tubers obtained through the Foreign Office from Bogota, nor from the seed obtained through the same source and transmitted to India from Kew in the following year.

“ In 1882, it was ascertained that the *Arracacha* was naturalised on the hills in Jamaica, and Mr. Morris, the Director of Public Gardens and Plantations in the Colony, stated that he believed it ‘ to be a most valuable food-plant,’ and that for his own part he not merely liked it, but found it to become more palatable and desirable the longer it was used. He added—

“ ‘ If the natives of India take to it as an article of food, I can conceive nothing more likely to flourish in the hill districts, and to

“ ‘ afford, with little labour, the means of sustaining life under adverse
“ ‘ circumstances.’ ”

“ A supply of tubers received at Kew from Jamaica was sent in 1883
“ to Saharunpur, Ootacamund, and Ceylon, and in 1884 to Calcutta,
“ for Darjeeling. Mr. Lawson, Director of Government Cinchona
“ Plantations, Parks, and Gardens, Nilgiris, reported in 1884 that plants
“ had been raised from the tubers sent from Kew. The result in the
“ other two botanical establishments in India has not reached us.

“ From Ceylon Dr. Trimen has recently reported that he has raised the
“ *Arracacha* from seed obtained direct from Jamaica. He appears to
“ have obtained the tubers without difficulty and in abundance. As a
“ matter of taste, he has a less favourable opinion of them than Mr.
“ Morris. But the point to which I wish to draw your attention is
“ that the introduction of the esculent into India is accomplished, and
“ that its further diffusion need present no difficulty.”

In the Report of the Director of the Botanical Gardens, Ceylon, for
1884, the *Arracacha* is mentioned as “ an umbelliferous plant, native
“ probably of the Andes of South America, where it is cultivated up to
“ 6,000 feet, was introduced into Jamaica in 1822, and produces large
“ edible starchy roots, with the flavour somewhat of parsnip. Two or
“ three attempts to import the roots in a living state into Ceylon have
“ proved completely unsuccessful; but Mr. Nock has now succeeded in
“ raising some young plants from seeds sent from Jamaica, which it is
“ hoped will in time develop the edible portion.”

In the Report for the year 1886 it is stated that—

“ The *Arracacha* is not generally liked by Europeans (though some
“ like it), but much enjoyed by all the natives who taste it. Mr. Nock
“ reports a good stock at Hakgala, and I am prepared to distribute
“ through the Government Agents small quantities to the headmen of
“ villages at 2,000 feet or more elevation, in the hope of its culture being
“ taken up by the villagers. Much interest has been excited in India
“ by the successful introduction of this vegetable in Ceylon, and in
“ answers to applications we have sent boxes of the roots to the Botanic
“ Garden at Saharunpur, the Agri-Horticultural Society of Calcutta,
“ and the Chief Commissioner of British Burmah.”

Dr. King, in his Report on the Calcutta Botanic Gardens for the year
1886, mentions that—

“ A small supply of the tubers of an eatable, umbelliferous plant named
“ *Arracacha esculenta* were sent to this garden from Kew two years
“ ago. As the climate of Calcutta was considered unsuitable for the
“ cultivation, these tubers were sent to Mungpor, where, under Mr.
“ Gammie's care, some of them are now thriving well. As the tubers
“ are still few in number and too precious to be sacrificed for food, I
“ have not tasted this new vegetable.”

In the Report of the Superintendent of the Saharunpur Gardens for
the year 1881, under *Arracacha* it is mentioned that—

“ The seed of this new kind of vegetable was sown in this Garden.
“ The result is eleven plants; none are sufficiently grown yet to say
“ more of them than that they look quite healthy.”

In the Report for 1883 it is stated that—

“ Of the valuable South American vegetable *Arracacha* there are a
“ few plants still left, and they are in a fairly healthy condition.”

Arracacha plants are under cultivation at Kew, but it is not possible
to produce good tubers, owing to the short period during which they can

be cultivated in the open ground. They have failed also in France and in the South of Europe (*The Vegetable Garden* by MM. Vilmorin-Andrieux, p. 3). Specimens of the edible roots are in the Kew Museums from Jamaica, 1884, presented by Mr. D. Morris; from the Botanical Department, Jamaica, Colonial and Indian Exhibition, 1886; and there is a specimen of starch prepared at Jamaica from Arracacha presented by Dr. Macfadyen.

XVI.—CHERIMOYER.

(*Anona Cherimolia*, Mill.)

This is a sub-tropical member of the genus *Anona*, a native of the Andes of Ecuador and Peru. Like the species which yield the sweet-sop, sour-sop, and custard-apple, the Cherimoyer is a tree of about 15 feet to 20 feet high, with loose spreading branches and velvety leaves. In botanical character it appears to hold a place between the sweet-sop (*A. squamosa*) and the custard-apple (*A. reticulata*); the leaves partake of some of the character of both, and the fruit is somewhat scaly like that of the former, and reticulated like that of the latter.

As in most plants which have been a long time under cultivation, there are numerous varieties more or less differing as regards the size and character of the fruit, but it is generally agreed that the Cherimoyer is the most delicious of its kind, the flesh being firm, of a flaky character, and possessing a slightly agreeable acidity mingled with a luscious sweetness. The flowers are pendant and velvety; they are generally closed in the day and open at night, giving out a delicate odour resembling that of *Magnolia fuscata*. On this account they are said to be put into snuff as a substitute for the Tonquin bean. The fruit is usually the size and form of the sour-sop, of a light green colour, with a snowy-white pulp and black seeds.

De Candolle, discussing the origin of this species, states that "the Cherimoyer is mentioned by Lamarck and Dunal as growing in Peru; but Feuillée, who was first to speak of it, says that it is cultivated. Humboldt and Bonpland saw it cultivated in Venezuela and New Granada; Martius in Brazil, where the seeds had been introduced from Peru. The species is cultivated in the Cape Verde Islands and on the coast of Guinea. Its American origin is evident. Claude Gay says that the species have been cultivated in Chili from time immemorial. In conclusion, I consider it most probable that the species is indigenous in Ecuador, and perhaps in the neighbouring part of Peru."

A rough drawing of the fruit is given by Feuillée, *Journ. des Obs.*, Vol. II., p. 24, tab. 17; the leaves and flowers are figured in *Bot. Mag.*, tab. 2011, under the name of *Anona tripetala*, Ait. The only recent figure intended to be given is by Rodigas in *L'Illustration Horticole*, N.S., pl. 563, but in colour and the absence of reticulations and of the subsquamate character inseparable from the Cherimoyer this figure more nearly resembles that of the custard-apple (*A. reticulata*).

The Cherimoyer is very common in the mountains in Jamaica, and it must have been introduced there many years ago. It requires such sub-tropical conditions as are connected with a mean annual temperature 78° to 63° Fahr., an annual rainfall of about 80 to 100 inches, and a fairly rich soil.

It is fairly abundant at Madeira, whence the fruit arrives in the autumn to the English market. It is also found at St. Helena and on the coast of Guinea, and its introduction to the mountainous districts of Ceylon and India has now been assured.

There is a tall plant under cultivation in the warm Economic House at Kew, but it has not flowered or fruited here. Specimens of Cherimoyer fruits are represented in the Kew Museums from Lima, presented by Sir Spencer St. John; from Botanical Department, Jamaica, Colonial and Indian Exhibition, 1886; and a fruit grown at Wallington, Newcastle, presented by Sir W. Trevelyan.

Seed of the Cherimoyer in large quantities were sent from Jamaica to Ceylon, and in the Report of the Director of the Botanical Gardens for the year 1884 it is mentioned—

“There is a good supply of seedling Cherimoyer trees available at Hakgala. The fruit of this tree is considered to be far superior to the other species of the genus *Anona* (the custard-apple, sweet-sops, &c.), but the tree is adapted only to the hill climate in Ceylon.”

In the Report on the Saharunpur Gardens for the year 1885, Mr. Duthie states :—

“A case containing 13 lbs. of seeds of the Cherimoyer of Peru was lately received from Mr. Morris, Director of Public Gardens at Jamaica. Many of the seeds were useless owing to their having germinated on the way, but a fair proportion arrived in good order and are now appearing above ground.”

It would appear that in Southern India the Cherimoyer was introduced many years ago, and Deputy Surgeon-General Shortt gives the following account of it in a letter to the Agri-Horticultural Society of Madras, dated 27th September 1884 :—

“I am sending you by this day's sample post 18 seeds of the Cherimoyer (*Anona Cherimolia*). The seeds of this fruit were originally sent from Spain by retired Colonel R. Hunter to the late Captain Short on these hills, who successfully grew several plants, which were distributed among his sons up here. I also received a plant out of some 18 or 20 plants. One plant fruited freely this season, and seeds from it I now have the pleasure to send the Society.

“The fruit I received was the size of a double fist or that of a large cocoanut, quite round, with a yellowish tinge of green colour, subsquamous and reticulated. In other respects it had all the appearance of the common custard-apple, with a most delicious and delicate flavour, and I hope you will be able to raise plants from the ‘pips’ I send you.”

Diaz, in *El Agricultor Venezolano*, mentions that the fruit of the Cherimoyer is very much appreciated, and its taste very pleasant, especially in cool districts in the hills, where the temperature suits it best. It is used for dessert, like the medlar, peach, &c. &c. The external portion of the husk is said to contain an active acid. The pulp is employed as a medicine for the alleviation of inflamed ulcers and for the maturing of abscesses. The seeds of all the species of this genus when reduced to powder are used for destroying insects.

D. M.